16. An electromagnetic device, that is a linear or rotary single- or multi-phase motor or generator, comprising, for each phase, at least two relatively-movable sets of teeth made of soft magnetic material, one set of teeth being associated with the stator and the other with the rotor, the device being of a size enabling it to generate a maximum magnetic potential U_{max} of about $1.7\times10^{-4}J/\mu_0$ ampere turns (At), wherein the width E of the minimum air-gap between teeth of the rotor and of the stator as measured in the direction perpendicular to their degree of freedom is approximately equal to or greater than:

A' SUB B'

the value

$$0.7[1 - 5\times10^{-4}(U_{max} - 1.7\times10^{-4}J/\mu_0)]\mu_0U_{max}/J$$

when

$$[1 - 5\times10^{-4}(U_{max} - 1.7\times10^{-4}J/\mu_0)] \geq 0.5$$

or the value $0.35\mu_0U_{max}/J$

when

$$[1 - 5\times10^{-4}(U_{max} - 1.7\times10^{-4}J/\mu_0)] < 0.5$$

or that E is greater than 2×10^{-3} m;

where μ_0 is the permeability of a vacuum, U_{max} is the maximum generated magnetic potential difference for causing the magnetic field to pass through the air-gap E, said potential difference being due either solely to the ampere-turns of the coil(s) feeding the air-gap E, or to the sum of said ampere-turns plus the magnetic potential difference between the two sets of teeth in the absence of currents due to a permanent

magnet, and where J is the maximum polarization of the soft magnetic material used for making the teeth.

17. A device according to claim 16, wherein the width E of the air-gap is smaller than or approximately equal to the value $1.1\mu_0 U_{max}/J$.

18. A device according to claim 16, wherein the width E of the air-gap is greater than 1.2×10^{-4} m.

19. A device according to claim 16, wherein the width E of the air-gap is greater than 1.5×10^{-4} m.

20. A device according to claim 16, wherein hollows (22, 22") between the rotor teeth are essentially of parabolic shape.

21. A device according to claim 16, wherein hollows (21) between the teeth of the stator are essentially of parabolic shape.

22. A device according to claim 20, wherein the angle β formed between the tangents to the profile of the teeth on the corners thereof has a value lying in the range 95° to 120°.

23. A device according to claim 21, wherein the angle β formed between the tangents to the profile of the teeth on the corners thereof has a value lying in the range 95° to 120°.

24. A device according to claim 22, wherein the angle β has a value lying in the range 100° to 115°.

25. A device according to claim 23, wherein the angle β has a value lying in the range 100° to 115°.

26. A device according to claim 16, wherein the pole pieces of the stator (12) are uniform in length in the axial direction, and uniform in width in a radial plane, and wherein the coils (5) are prefabricated coils on insulating supports (15), said coils and pole pieces of the stator being arranged in such a manner as to enable the prefabricated coils to be put into place on said stator pole pieces.

G1 cont.

27. A device according to claim 16, wherein the device is a hybrid motor comprising a permanent magnet (10) delivering magnetic potential so that the total magnetic potential difference at the terminals of the air-gap is substantially equal to $0.5U_{max}$.

28. A device according to claim 27, wherein the rotor (2) is generally cylindrical in shape being constituted by at least one assembly in axial alignment comprising the permanent magnet (10) in the form of an axially-magnetized annular disk, and two magnetically-permeable rotor pole pieces (6, 7) disposed on either side of said disk.

29. A device according to claim 16, wherein the device is a variable reluctance motor or generator.

30. A device according to claim 29, wherein an end (28) of a stator pole piece (12") is curved with a radius such that,

when the teeth of the stator and the rotor are facing each other, the air-gap between them is of varying width.

31. A device according to claim 16, wherein the air-gap width E is greater than or essentially equal to the value $0.7\mu_0 U_{max}/J$.

32. A device according to claim 31, wherein the air-gap width E is greater than or essentially equal to $0.8\mu_0 U_{max}/J$.

Respectfully submitted,

By: _____

Clifford W. Browning
Reg. No. 32,201
Woodard, Emhardt, Naughton,
Moriarty & McNett
Bank One Center/Tower
111 Monument Circle, Suite 3700
Indianapolis, Indiana 46204-5137
(317) 634-3456

#154180